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Euphalerus clitoriae sp. n., a new psyllid species from *Clitoria fairchildiana* (Fabaceae, Papilionoideae), and notes on other *Euphalerus* spp. (Hemiptera, Psylloidea)

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***Euphalerus clitoriae* sp. n., a new psyllid species from *Clitoria fairchildiana* (Fabaceae, Papilionoideae), and notes on other *Euphalerus* spp. (Hemiptera, Psylloidea).** - *Euphalerus clitoriae* sp. n. from Brazil, a species developing under waxy filamentous secretions on the leaves of *Clitoria fairchildiana*, is described and illustrated. Its biology is briefly outlined and compared to that of its closest relatives, viz. *E. nidicola* from Peru and *E. uaya* from Belize. Differences to these two species are discussed. Based on the study of types, the genitalia of *E. nidicola*, *E. antillensis* and *E. ostreoides* are illustrated completing their insufficient original descriptions.

Key-words: Psylloidea - Fabaceae - Brazil - taxonomy - biology.

INTRODUCTION

The hemipterous jumping plant-lice or psylloids are usually highly host specific and thus a potentially suitable taxon for coevolutionary studies on insect – plant relationships (Burckhardt & Basset, 2000). The necessary taxonomic and phylogenetic base is, however, often insufficient or completely lacking. The genus *Euphalerus* is a good example. It was erected for the Carribean species *E. nidifex* whose larvae form lerps or "nests", i.e. waxy coverings, on Fish poison Bark or Jamaican dogwood (*Piscidia piscipula* and *Piscidia carthegenensis*, Fabaceae, Papilionoideae, Tephrosieae) (Schwarz, 1904; Russell, 1971). Subsequently, a series of mostly tropical New and Old World species were referred to the genus making it extremely artificial. According to Hollis & Martin (1997), the New World species forming lerps or galls on the leaves of Fabaceae make up true *Euphalerus* (Psyllidae, Euphalerinae). The other New World species, associated with *Ceanothus* (Rhamnaceae) and *Cerocarpus* (Rosaceae), are unrelated and belong to the Arytaininae/Psyllinae (Psyllidae) complex. The Old World species, finally, are probably referable to the euphalerine genera *Colophorina* Capener and *Euryconus* Aulmann.

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Twenty two species are currently known in *Euphalerus* s. str. The vast majority is associated with *Lonchocarpus* (Papilionoideae, Tephrosieae). One species is each on *Pithecellobium* (Mimosoideae, Ingeae), *Erythrina* (Papilionoideae, Phaseoleae) and *Piscidia* (Papilionoideae, Tephrosieae) respectively, two species have unknown and one doubtful (*Karwinskia*, Rhamnaceae) host records. Nineteen species are recorded from Central America with one species extending to Florida, and only three are also or exclusively known from South America (Brazil 2, Peru 1) (Hollis & Martin, 1997).

The present paper describes a new species from Brazil developing on *Clitoria fairchildiana* (Papilionoideae, Phaseoleae). The new species broadens the known host range of *Euphalerus*, and suggests that the genus may be more diverse in tropical South America than currently estimated. It is closely related to the gall-forming *E. nidicola* Tuthill from Peru whose larvae are covered in waxy secretions, and the lerp-inhabiting *E. maya* Hollis & Martin from Belize. Hollis & Martin (1997) provided detailed descriptions of the species attacking *Lochocarpus* in Belize. Here we give illustrations of the male and female genitalia of *E. antillensis* Caldwell & Martorell and *E. nidicola* Tuthill, and of the male genitalia of *E. ostreoides* Crawford whose original descriptions lack sufficient detail and which were not treated by Hollis & Martin (1997).

MATERIAL AND METHODS

The morphological terminology follows Hollis (1976) and Hollis & Martin (1997). Measurements and some drawings were made from slide mounted material. The drawings for *E. antillensis* and *E. nidicola* were made from temporary mounts in glycerine.

Material is cited from following institutions: Naturhistorisches Museum Basel, Switzerland - NHMB; Angelo Moreira da Costa Lima Entomological Collection, Seropédica, Brazil - CLEC; Natural History Museum, London, UK - BMNH; United States National Museum of Natural History, Washington, DC, USA (psylloid collection in USDA, Beltsville, MD) - USNM; Muséum d'histoire naturelle, Geneva, Switzerland - MHNG.

TAXONOMIC TREATMENT

Euphalerus clitoriae sp. n. Figs 1-3, 13, 16-23

Holotype ♂, Brazil: State of Rio de Janeiro, Campus and residential area of the Universidade Federal Rural do Rio de Janeiro, Seropédica, 22°44' S 43°43' W, 9.ix.1999, *Clitoria fairchildiana* (M. Guajará), dry mounted (NHMB).

Paratypes, Brazil: 20 ♂, 20 ♀, 10 larvae or larval skins, same data as holotype, dry mounted (NHMB, CLEC, BMNH, USNM, MHNG); 6 ♂, 6 ♀, 4 larvae, same data but 30.v.1999, dry and slide mounted (NHMB, CLEC, BMNH).

Material not included in type series. Brazil, many adults and some larvae, same data as holotype but 30.v.1999 and 9.ix.1999, preserved in 70 % alcohol (NHMB).

Adult. Body dirty greyish white with small blackish dots, in mature specimens thorax dorsally, abdomen and genitalia dark. Antennal segments 1-8 light with dark apices, segments 9 and 10 entirely dark. Forewing membrane transparent, colourless, with blackish dots as in fig. 16, middle of cells very weakly infuscate; veins whitish with black dots. Legs whitish with dark dots, tarsi blackish.

Small species (see measurements below). Genal processes longer than vertex along mid-line, conical, subacute apically (fig. 17). Antenna 1.97-2.13 times as long as head width, segment 3 (1.32 times) longer than segment 8. Ultimate two rostral segments 0.41-0.43 times as long as head width. Forewing (fig. 16) 2.24-2.31 times as long as wide, 3.67-3.93 times as long as head width; pterostigma moderately long, 0.5 times as long as vein Rs; surface spinules leaving broad spinule-free stripes along the veins; reduced in basal half of cell r_1 and r_2, occupying only a small area in cell c+sc. Metatibia 0.93-0.97 times as long as head width, bearing a small basal spine and an incomplete crown of apical spurs.

Male proctiger (fig. 1) bulbous, lacking lateral lobes. Paramere in profile (fig. 2) with each an anterior and a posterior lobe. Distal portion of aedeagus (fig. 3) hook-shaped; apex of terminal tube of ductus ejaculatorius truncate.

Female proctiger (fig. 13) more or less evenly tapering, dorsal margin weakly concave, apex narrowly rounded; 1.00 times as long as head width, 3.21 times as long as circumanal ring, 1.56 times as long as subgenital plate.

Measurements in mm (1 ♂, 1 ♀). Head width 0.63; antenna length 1.25-1.35; forewing length 2.33-2.50; male proctiger length 0.26; paramere length 0.23; length of distal segment of aedeagus 0.23; female proctiger length 0.63.

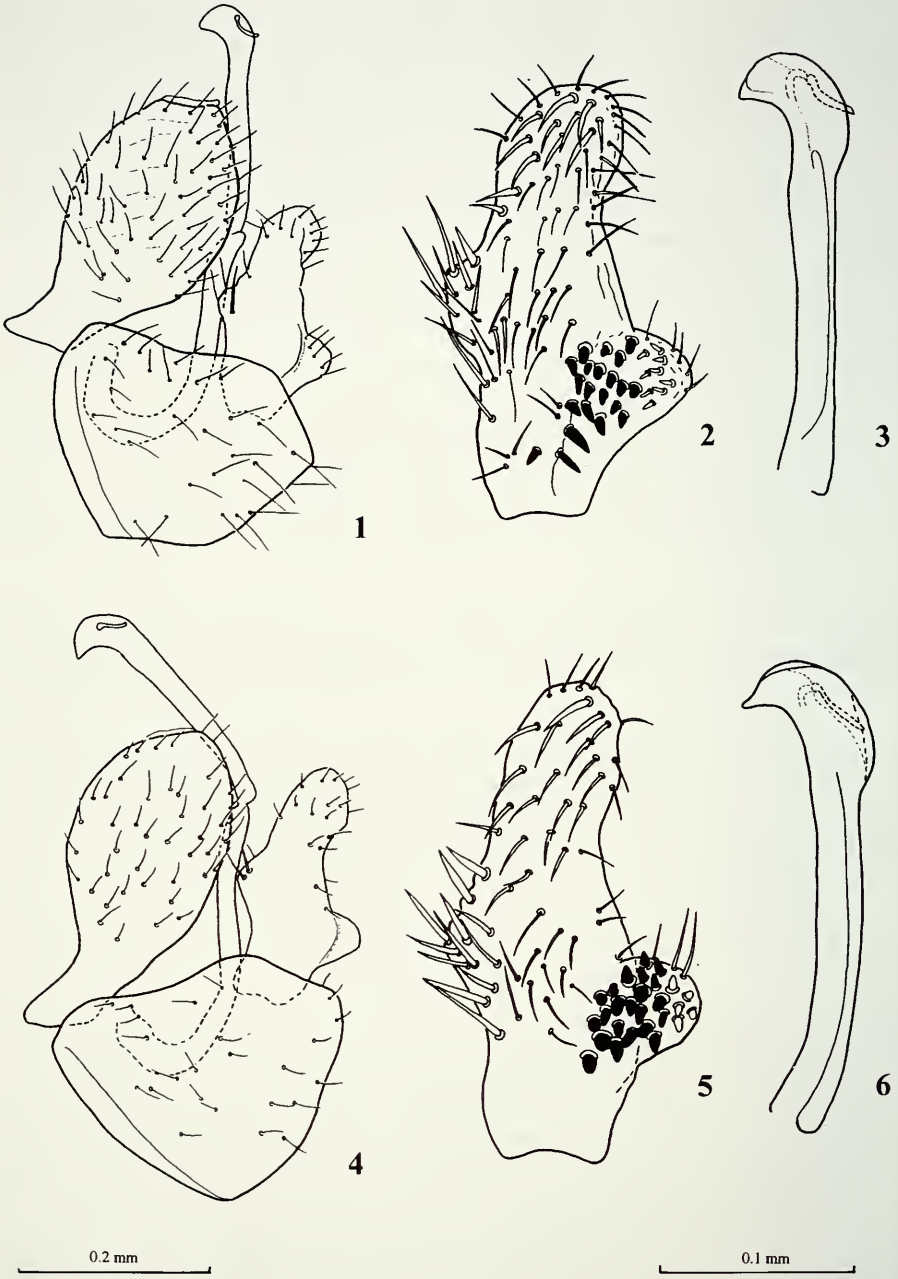
Fifth instar larva (fig. 18). Antenna 8-segmented with one rhinarium on each of segments 3, 5, 7 and 8. Tibiatarsus of foreleg with one large apical and one smaller subapical spur (fig. 19); tibiotarsi of mid and hindlegs with one large and two small spurs. Subgenital plate with two apical processes bearing three teeth each (fig. 20).

Host plant. Clitoria fairchildiana Howard (= *racemosa*) (Fabaceae).

Biology. The eggs are laid along the veins of the leaves. The larvae sit on the leaves and stems hidden under white coverings consisting of waxy hair-like filaments (fig. 21). There is no sign of deformations on the leaves (fig. 22). When the larval density is high, the leaves turn yellow and drop. Strongly infested trees can loose all their leaves (fig. 23).

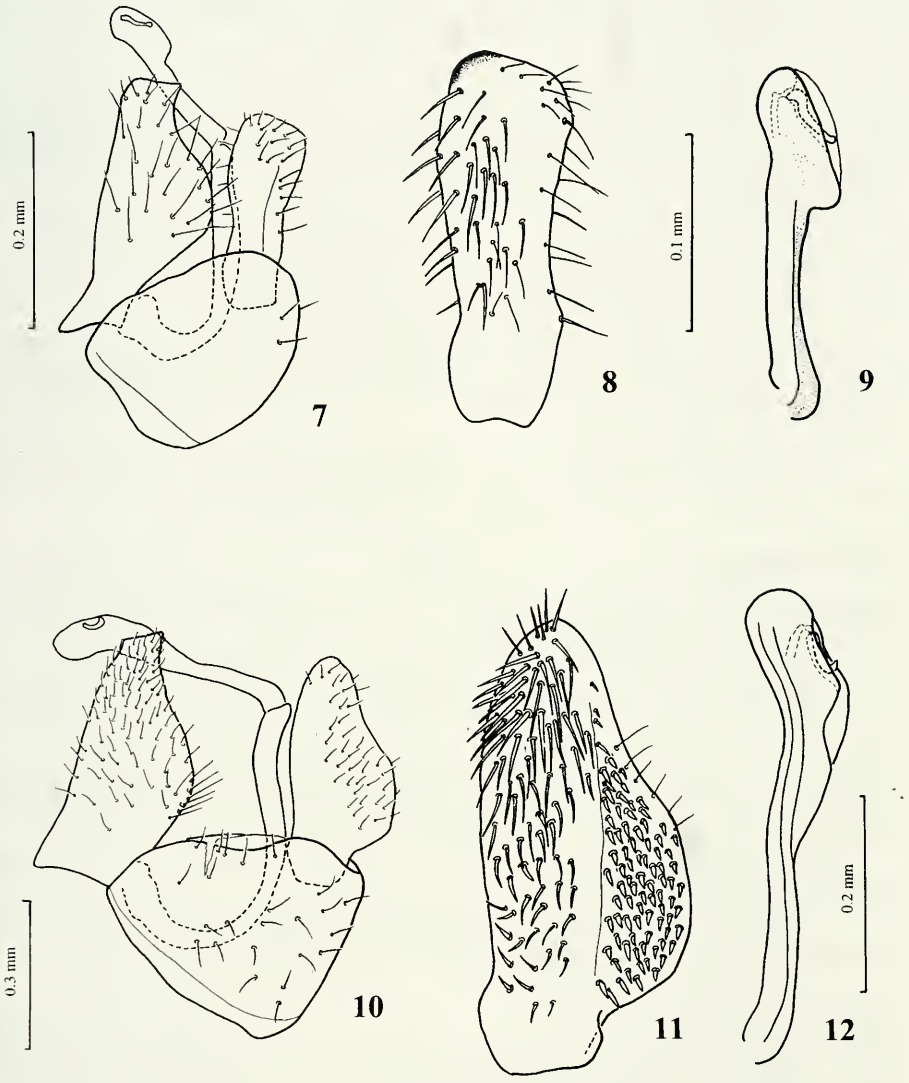
Comments. E. clitoriae, which is a member of the *E. ostreoides* species group as defined by Hollis & Martin (1997), is closely related to *E. nidicola* Tuthill, 1959 from Peru, and *E. maya* Hollis & Martin, 1987 from Belize based on following characters. Small sized *Euphalerus* spp.; head with long, conical genal processes; antenna longer than 1.5 times head width; forewing clear, bearing dark spots lacking transverse bands; metatibia with a small basal spine and an incomplete crown of apical spurs; male proctiger bulbous without lateral lobes; paramere complex, irregularly S-shaped with a group of long thick setae in the middle of the foremargin and a group of heavily sclerotised peg setae on the inner surface of the posterior lobe; female subgenital plate, in profile, with angular ventral margin.

E. clitoriae differs from *E. maya* in the slightly larger body dimensions, the longer antenna, the shorter pterostigma of the forewing, the details in the genital structure and the apex of the larval caudal plate which has three points on each tubercle instead of two. *E. clitoriae* is differentiated from *E. nidicola* by the much more expanded, almost black body coloration, which is orange to light brownish in *E. nidicola*, the blackish dots on the forewings which are brown in *E. nidicola*, the shorter



FIGS 1-6

Euphalerus spp. 1, 4: Male genitalia, in profile; 2, 5: paramere, inner face; 3, 6: distal portion of aedeagus. 1-3: *E. clitoriae* sp. n.; 4-6: *E. nidicola* Tuthill. Scale lines: figs 1, 4 = 0.2 mm, figs 2, 3, 4, 6 = 0.1 mm.



FIGS 7-12

Euphalerus spp. 7, 10: Male genitalia, in profile; 8, 11: paramere, inner face; 9, 12: distal portion of aedeagus. 7-9: *E. antillensis* Caldwell & Martorell; 10-12: *E. ostreoides* Crawford. Scale lines: fig. 7 = 0.2 mm, figs 8, 9 = 0.1 mm, fig. 10 = 0.3 mm, figs 11, 12 = 0.2 mm.

antenna, the more reduced fields of surface spinules in the forewing, the details of the genitalia (for *E. nidicola* see figs 4-6, 14); the female proctiger is slightly shorter and apically more thickened in *E. clitoriae* but longer and apically pointed in *E. nidicola*.

The three species differ also in their geographical and host plant ranges. The larval biology of *E. clitoriae* is intermediate. It shares with *E. nidicola* waxy filamen-

tous coverings but differs by not causing depressions on the leaves. This character is as in *E. maya* which is characterised by the production of a lerp.

Euphalerus antillensis Caldwell & Martorell Figs 7-9, 15

Euphalerus antillensis Caldwell & Martorell, 1951: 612. Holotype ♂, Puerto Rico: Guànica, on the Guànica - Guánica Central Road, in front of stone quarry, 28.viii.1947, breeding abundantly on the undersides of the leaves of "geno-geno", *Lonchocarpus domingensis* (Caldwell & Martorell) (USNM).

Material examined. Puerto Rico: 1 ♂, 1 ♀ paratypes, same data as holotype (USNM).

Adult. Member of the *nidifex* species group (as defined by Hollis & Martin, 1997). Metatibia with a small basal spine and grouped apical spurs.

Male proctiger (fig. 7) with narrow lateral lobes. Paramere in profile (fig. 8) lamellar, obliquely truncate apically, inner surface covered in long setae. Distal portion of aedeagus (fig. 9) with oval apical dilatation, rounded apically; apex of terminal tube of ductus ejaculatorius rounded.

Female proctiger (fig. 15) strongly tapering to the middle, digitiform in apical half, dorsal margin strongly concave, apex narrowly rounded.

Euphalerus nidicola Tuthill Figs 4-6, 14

Euphalerus nidicola Tuthill, 1959: 6. Holotype ♂, Peru: few km below La Merced, 1.i.1947, on "oropel", *Erythrina* sp. (Tuthill) (USNM).

Material examined. Peru: holotype ♂, allotype ♀, 1 ♂, 1 ♀ paratypes (USNM).

Adult. Member of the *ostreoides* species group (as defined by Hollis & Martin, 1997).

Male proctiger (fig. 4) bulbous, lacking lateral lobes. Paramere in profile (fig. 5) with each an anterior and a posterior lobe. Distal portion of aedeagus (fig. 6) hook-shaped; apex of terminal tube of ductus ejaculatorius truncate.

Female proctiger (fig. 14) irregularly tapering, dorsal margin weakly but distinctly concave, apex subacute.

Fifth instar larva. Tuthill (1959) mentioned the presence of many larvae. In the collection of the USNM we could, however, find only the adult types.

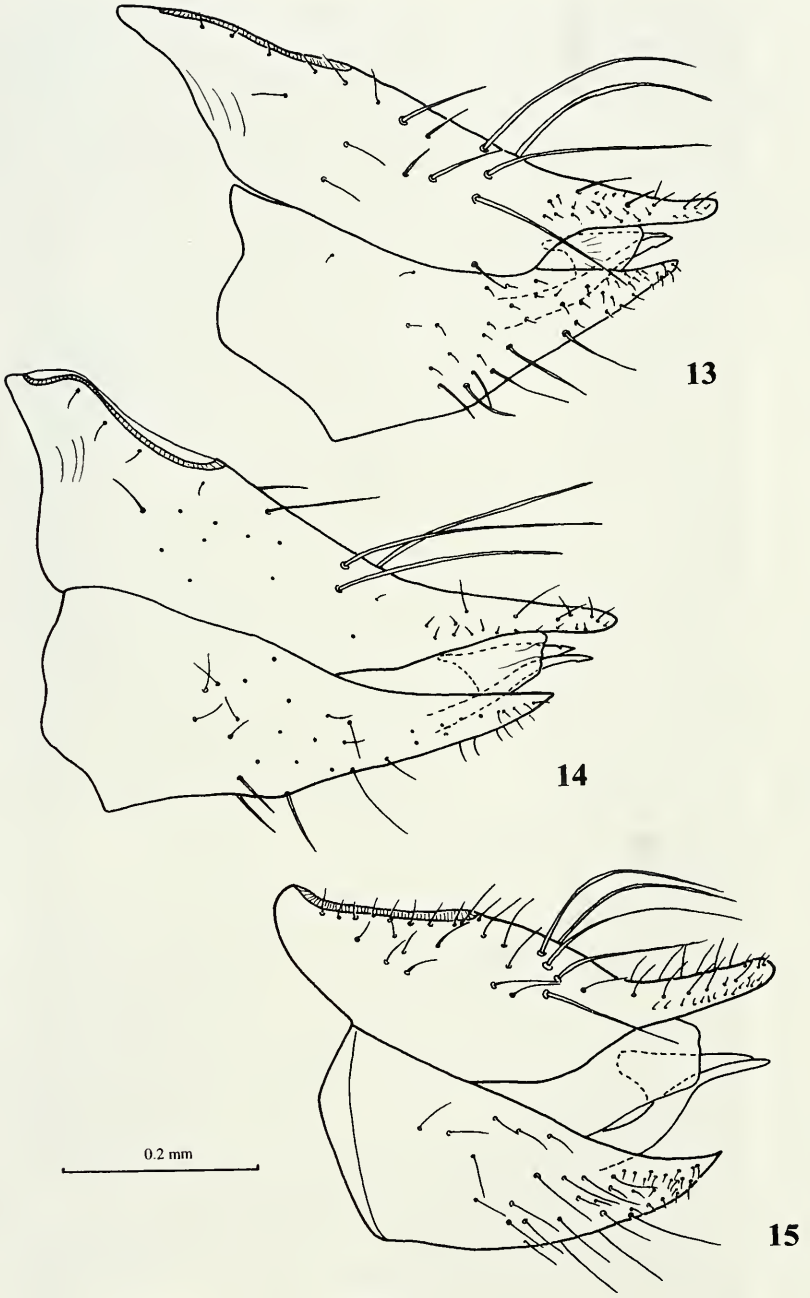
Euphalerus ostreoides Crawford Figs 10-12

Psyllid, Tavares, 1920: 124; 1922: plate 19 figs 3-5. Galls on the leaves of an undetermined species of Leguminosae (Timbó), Brazil: Rio de Janeiro State, Nova Friburgo; Rio de Janeiro State, surroundings of Rio de Janeiro; São Paulo State, Itu; between Rio Vermelho and the city of Bahia.

Euphalerus ostreoides Crawford, 1925: 62. Syntypes 2 ♂, 1 ♀, Brazil: São Paulo, Itu, making very peculiar galls on the leaves of an undetermined species of Leguminosae (Tavares) (USNM). Costa Lima, 1942: 107; Silva *et al.*, 1968: 201; Russell, 1971: 10; Hollis & Martin, 1997: 241.

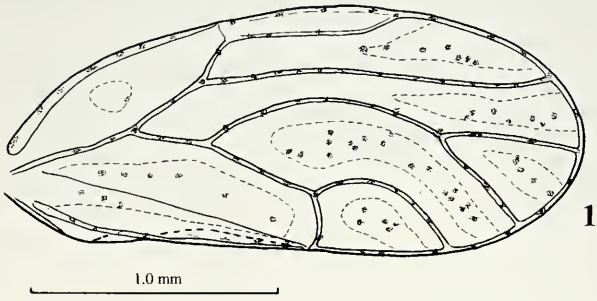
Material examined. Brazil: syntype ♂, São Paulo, Itu, (Tavares) (slide mounted, USNM).

Adult. Member of the *ostreoides* species group (as defined by Hollis & Martin, 1997). Large species (see measurements below). Genal processes shorter than vertex along mid-line, broadly rounded apically. Antenna 2.32 times as long as head width, segment 3 about as long as segment 8. Ultimate two rostral segments 0.39 times as long



FIGS 13-15

Euphalerus spp., female genitalia, in profile. 13: *E. clitoriae* sp. n.; 14: *E. nidicola* Tuthill; 15: *E. antillensis* Caldwell & Martorell. Scale line = 0.2 mm.



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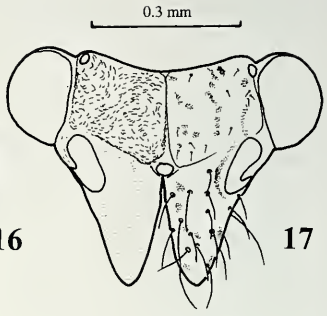

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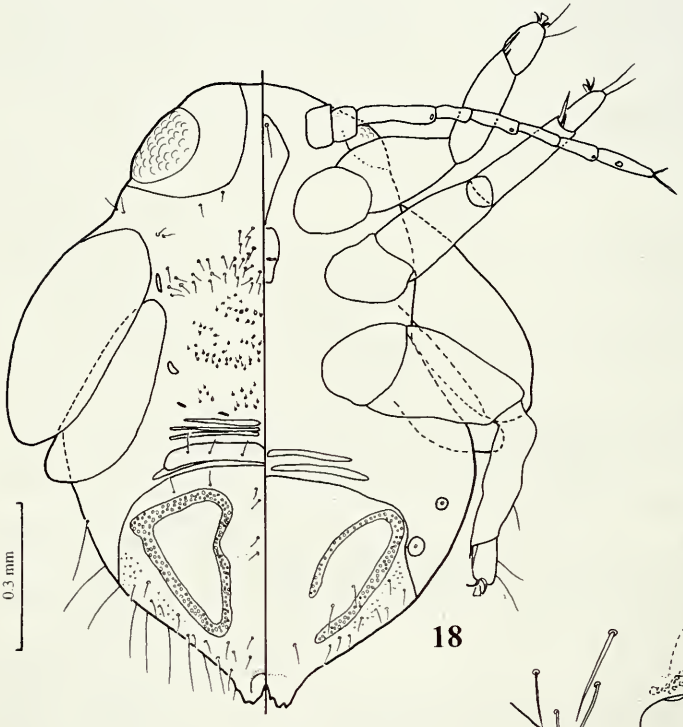

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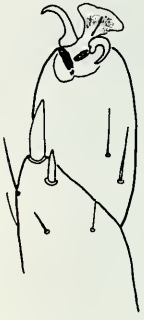

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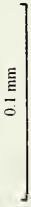

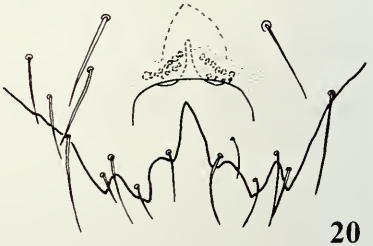

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FIGS 16-20

Euphalerus clitoriae sp. n. 16: forewing; 17: head, dorsal view; 18: fifth instar larva, left dorsal, right ventral view; 19: apex of foreleg of fifth instar larva; 20: apex of caudal plate, dorsal view. Scale lines: fig. 16 = 1.0 mm, fig. 17 = 0.3 mm, fig. 18 = 0.3 mm, figs 19, 20 = 0.1 mm.

FIG. 21. White waxy hair-like secretions by the larvae of *Euphalerus clitoriae* sp. n. on *Clitoria fairchildiana* leaves and stems.

FIG. 22. Wax covered larvae of *Euphalerus clitoriae* sp. n. on *Clitoria fairchildiana* leaves lacking pit-like deformations.

FIG. 23. Tree of *Clitoria fairchildiana* with almost no leaves due to heavy infestion of *Euphalerus clitoriae* sp. n.

as head width. Forewing 2.34 times as long as wide, 3.06 times as long as head width; pterostigma relatively short, 2.6 times as long as vein Rs; surface spinules present in apical part of all cells except for c+sc, leaving broad spinule-free stripes along the veins; radular spinules covering broad triangular patches along the wing margin in cells r_1, r_2, m_1, m_2 and cu_1. Metatibia 0.77 times as long as head width, bearing a conspicuous basal spine and an incomplete crown of apical spurs.

Male proctiger (fig. 10) with distinct lateral lobes. Paramere in profile (fig. 11) with a large posterior lobe, inner face with an anterior field of longer, more spaced setae and a posterior field with peg-like, densely spaced setae. Distal portion of aedeagus (fig. 12) rounded apically, with inflated apical half; apex of terminal tube of ductus ejaculatorius truncate.

Female unavailable.

Measurements in mm (1 ♂). Head width 1.15; antenna length 2.68; forewing length 3.54; male proctiger length 0.47; paramere length 0.47; length of distal segment of aedeagus 0.47.

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